

THE ATOM

Los Alamos Scientific Laboratory

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THE ATOM

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CONTENTS:

- 1 To Melt Holes in the Earth
- 7 Anderson Named Laboratory Fellow/
Silkscreens of LASL Scenes
- 8 Magnetic Pinch Machine for Smithsonian
- 10 Geothermal Energy for Electric Power?
- 15 LAMPF Beam Time Assigned to 61 Experiments
- 17 A White Christmas . . . The Hard way!
- 19 Short Subjects
- 20 The Technical Side
- 24 20 Years Ago/What's Doing

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COVER:

The red-hot glow of an electric subterrene's penetrator was used by ISD-7 Photographer Ivan Worthington to illuminate the faces of Andrew Giger, N-3, and Edward Keddy, N-5. Soon after this photograph was taken, the subterrene was used to melt a hole through the rock sample shown below the glowing penetrator. For more information on the subterrene, see the story which begins on page one.

*A subterrene
has completed
its first field tests
to Melt Holes in the Earth*

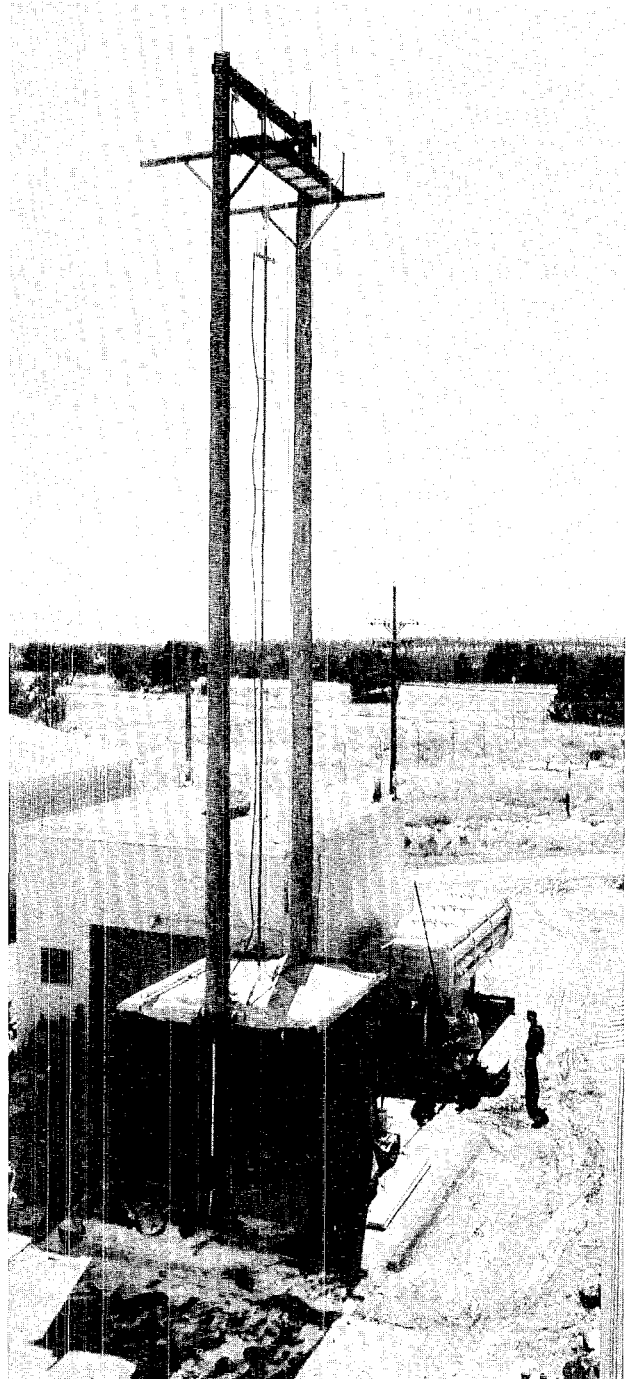
Scientists dismantle the apparatus used to melt the first of a series of 12-foot holes just outside the rock lab. In the foreground are the 60-foot utility poles and the test frame which contains the hydraulic ram and grabber to be used in the 50-foot subterrene test. The stem is suspended between the poles.

A series of holes, two inches in diameter and 12 feet deep, have been sunk in the tuff at Technical Area 46, marking the first field tests of a subterrene, a rock-melting device being developed at the Los Alamos Scientific Laboratory.

The tests were conducted just outside the "rock lab," the laboratory where various subterrene prototypes have been tested in small rock samples. The bores were made to investigate some of the design concepts and problems associated with "melting" deeper, larger-diameter holes.

One of the problem areas is, what happens when the subterrene is stopped? Even relatively shallow holes will require that an electric subterrene be stopped while sections are added to the stem. Stops and starts, although unavoidable during the field tests, are expected to effectively simulate this activity. The stem was in one section and pressure was exerted on it through a "pull-down" or "grabber" by a one-ton hydraulic ram with a 12-inch stroke. At the end of each stroke, the subter-

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A two-inch subterrene melts its way through a rock sample during a laboratory test as Albert Vandergust, left, and Richard Renfro, both of N-7, keep an eye on data recording equipment. At right are N-7 Group Leader John Rowley, subterrene project director; Joe Neudecker, N-7, project engineer; and Milton Krupka, CMB-3.

rene stopped while the grabber reached for a new hold.

The tests are also expected to provide information on subterrene retrieval and the use of water and gas coolants. According to Project Engineer Joe Neudecker, N-7, a gas-cooled subterrene was successfully tested in the rock lab. "One of the advantages of using gas," he said, "is that it won't corrode metal components of the subterrene."

Before Christmas the scientists will use the same subterrene used in the initial field tests to melt a 50-foot bore. For this test, a heavy structural test frame—previously used for testing Rover pressure vessels—has been placed near the rock lab. Two 60-foot utility poles, linked by a catwalk at the top, straddle the test frame. The subterrene will be suspended by its 50-foot stem from a pulley system on the catwalk. Power and coolant lines will be fed out from the catwalk as the subterrene





Neudecker, Philip Armstrong, CMB-13, and Richard Gido, N-7, watch data being recorded as the laboratory test progresses.

advances. Inside the test frame will be a hydraulic ram with a three-foot stroke which, as in the first field tests, will apply pressure on the stem through a grabber.

Following this test, experiments will be conducted with larger diameter penetrators. According to Neudecker, tentative plans are to melt a four-inch diameter hole 1,000 feet deep by mid-1972.

The subterranean project has been underway for about a year and a half, funded by the Atomic Energy Commission's Division of Military Application and directed by John Rowley, N-7 group leader. The ultimate goal of the project is to develop both electric and nuclear subterrenes. The requirement for two types of energy sources stems from expected "break-even" points -- where it becomes more practical to use one version than the other. For example, to melt a hole six feet in diameter may be as practical for one type as the other, but the cost of electrical power for a seven-foot hole could be so high that the nuclear subterranean could do the job more economically. The same could be true in remote areas where there is no electrical power or when it becomes impractical to transmit electricity to a subterranean in holes many miles long or deep.

To date all the subterrenes built have been electrically heated. Several prototypes have been built and laboratory-tested in a variety of rocks. "The idea of the subterranean," Rowley said, "is based on the fact that most rocks melt at about 1,200 degrees centigrade." At this temperature or slightly above, project scientists have successfully used one- and two-inch diameter subterrenes to melt holes through granite, tuff, basalts, limestones and Santa Fe conglomerate. With a three-kilowatt power supply—enough power to light 30 100-watt bulbs—holes have been melted at the rate of about 30 inches an hour. Until the recent field tests, the longest holes have been three feet, the stroke length of the hydraulic ram used in the rock lab.

The main components of the electric subterranean are the penetrator, coolant or radiator section, and stem. The penetrator makes contact with and melts the rock. Typically, it is cone-shaped and made of a refractory metal. Against its inside walls, an electrical insulator, which is also a good heat conductor, is wrapped around the subterranean's heating element. Another insulator separates the penetrator from the radiator section whose walls are cooled by either circulating water or a gas such as argon or nitrogen. Coolant and

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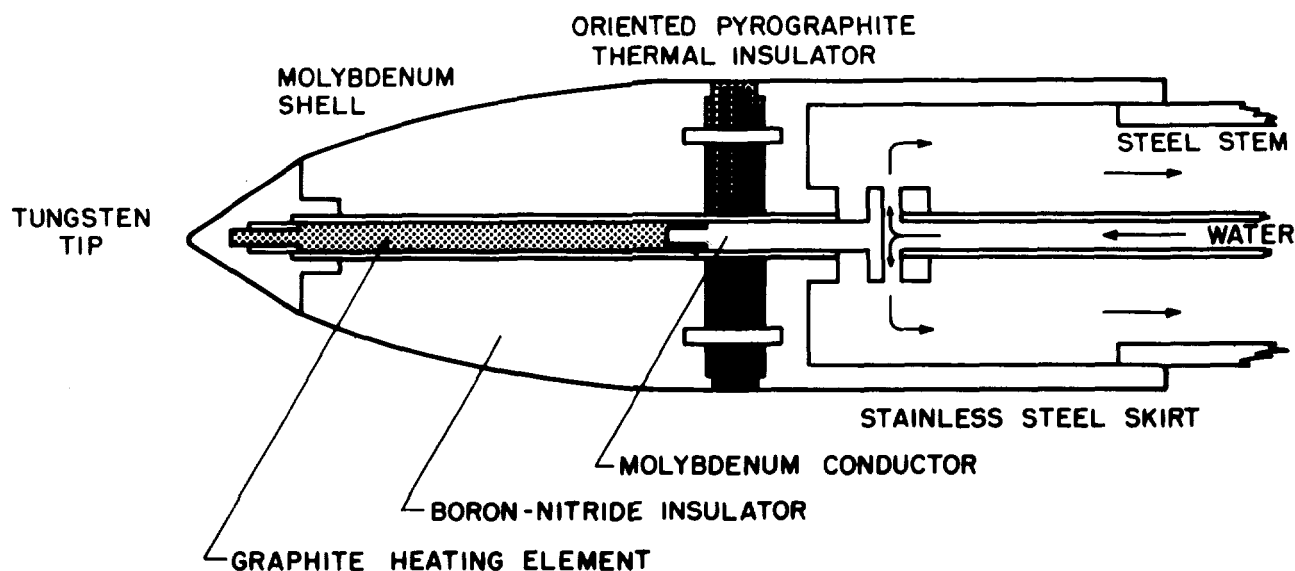
electrical feed lines are routed to their sources of supply through the stem. The stem is also the component to which pressure is applied to maintain contact between the penetrator and the hard rock ahead of it. While pressure must be applied initially as sections are added to the stem, their weight is expected to eventually overcome the necessity of a hydraulic ram or some other thrust system.

As the subterrene advances, molten rock is forced into voids in the walls of the hole and backward around the periphery of the penetrator. The molten rock is frozen in place by the cool surface of the radiator in such a way that an obsidian-like glass lining is formed on the wall. This is one of the most attractive features of the subterrene. In laboratory tests one-inch diameter subterrenes have typically formed one-quarter-inch-thick glass linings and two-inch diameter subterrenes have formed half-inch-thick linings. These linings are impermeable and strong so that hole walls are sealed and supported against cave-in. Since the glass forms as part of the bore walls it may be possible that the glass liner would be even more effective than concrete in supporting the walls of highway and railroad tunnels. Many have compressive strengths at least 10 times that of concrete.

The molten rock also forms a seal around the penetrator, tight enough for high pressures to be developed ahead of it. With more ruggedly built penetrators it is thought that pressure could be used to crack rock adjacent to the hole walls simi-



Krupka, Rowley and Neudecker discuss penetrator design concepts. On white paper in front of them are glass-like materials that were extruded through the stem of a subterrene. Below is a schematic of a subterrene design being tested.



lar to the cracks formed by hydrofracturing. The term coined by scientists for the subterrene technique is "lithofracturing." The penetrator would force molten rock into these cracks. Freezing there, the waste rock would be removed from the hole without being brought to the surface and, debris removal, one of the major problems in tunneling and deep-hole drilling, would be eliminated.

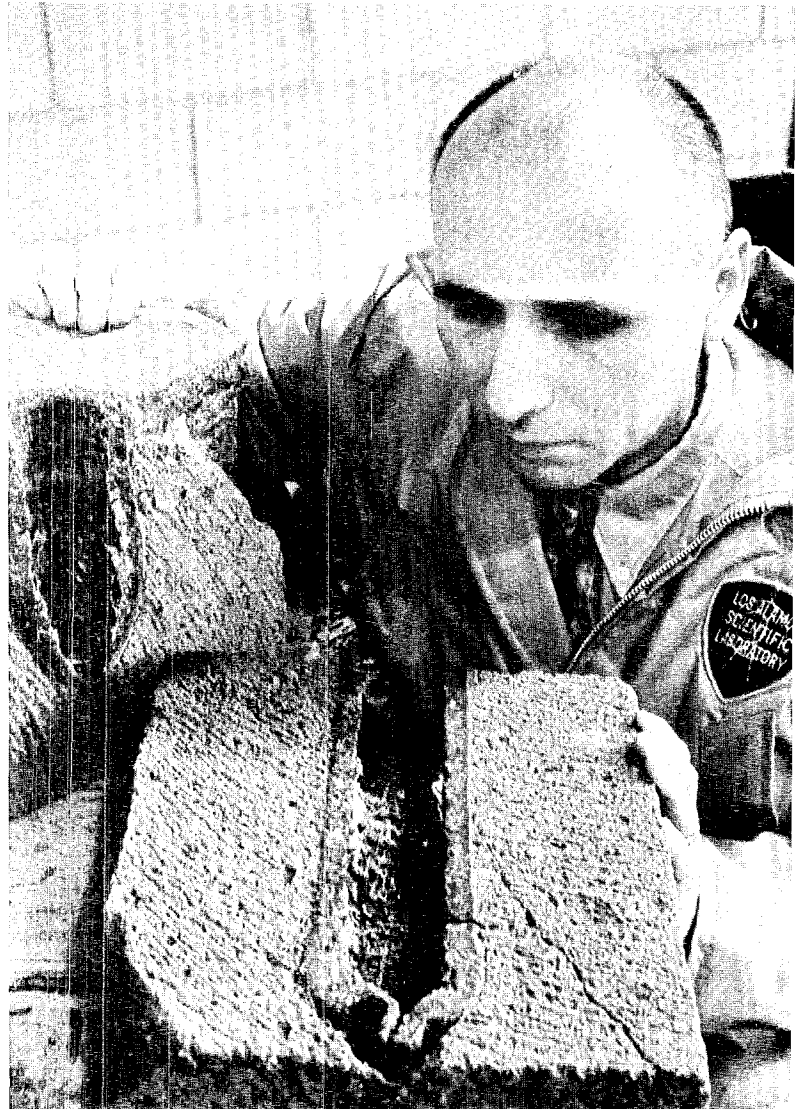
Some of the first subterrenes built were equipped to extrude waste rock through the stem. "It looks like black popcorn," said Rowley. It may be possible to develop a subterrene to extrude glass-lined core samples for the purpose of exploring and prospecting as far below the earth's surface as the mantle.

Another prospective feature of the subterrene is that its penetrator does not rotate. This would make it possible to melt holes of almost any shape. It may also be the solution to a problem inherent to rotary drills. When tunneling with a rotary drill, the bore has a tendency to gradually curve downward because of the weight and torque of the rotary bit. Because the penetrator does not rotate it may be possible to bore straighter holes with the subterrene.

The subterrene was invented in 1960 by members of Group CNC-4: Group Leader Eugene Robinson, Associate Group Leader B. B. McIn-
teer, Bob Potter, Dale Armstrong, and James Coleman who has since left the Laboratory. Because of other commitments, little work was done to further the development of the device for several years. During this period other scientists from several other groups (including N-7, N-5, N-3, CMB-13, CMB-3 and P-DO) became interested in the subterrene because of its potential social applications.

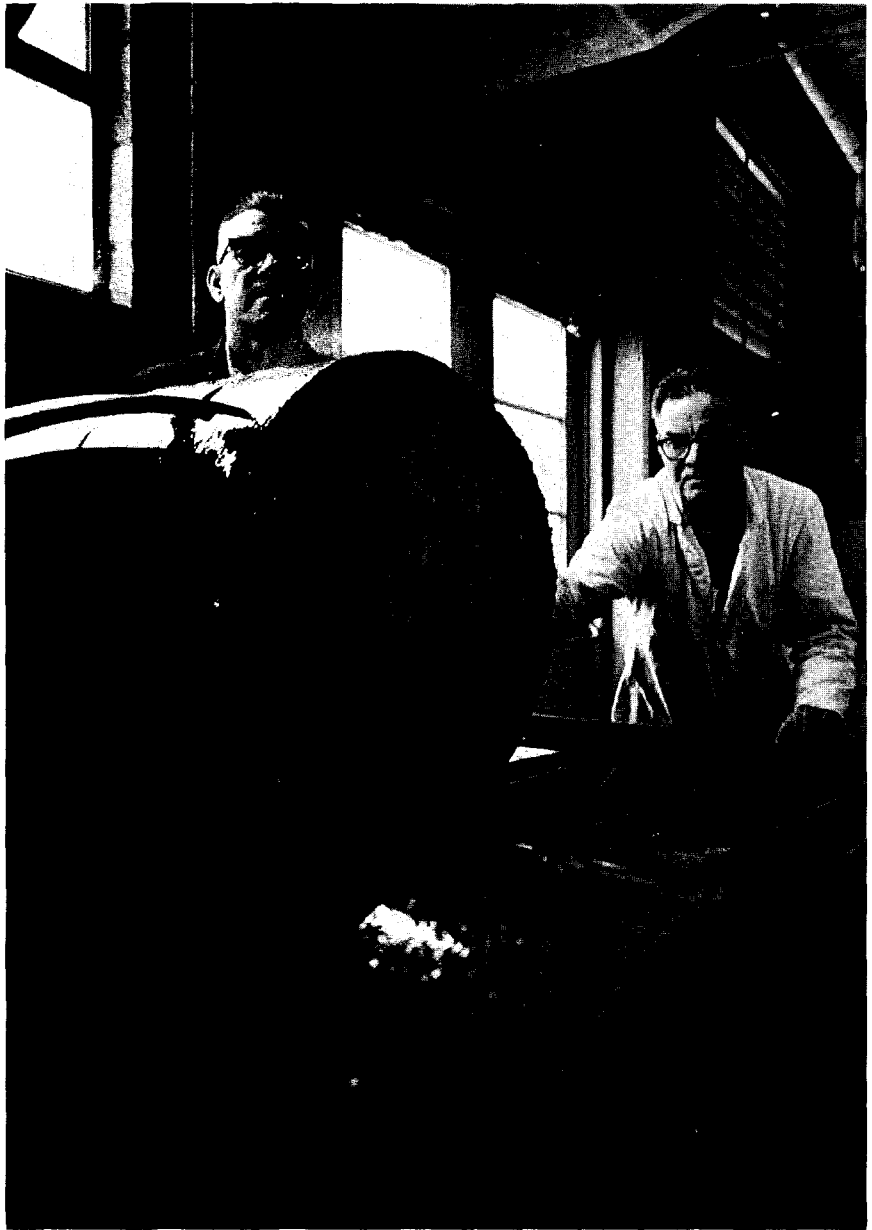
If the subterrene can be developed as a rapid, versatile, economical and ecological method of deep earth excavation, tunneling and shaft sinking, the list of its possible applications is seemingly endless. The scientists visualize applications such as the excavation of highway and railroad tunnels; subways; pipelines and channels for the collection and transportation of wastes; conduits for fresh water, drainage and irrigation; wells for petroleum, natural gas and water; mine entries and ventilation ducts; underground silos for missiles and their control systems; tunnels for the transportation of gases, liquids, fluidized solids, cargo and passengers; deep wells for disposal of domestic and industrial wastes or for storage of compressed gases, liquids and hazardous materials;

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Neudecker studies the glass-lined holes melted in two rock samples. The rocks were cut with a large saw to expose the hole cross sections.

Chuck Shampine, AEC fireman and N-7 casual, and Renfro cut the end off a rock sample that will be used in a laboratory test of a subterrene. The 36-inch, diamond-toothed blade is also used for longitudinal cuts required for cross-section studies.



underground chambers to contain nuclear and thermonuclear power reactors; and holes for prospecting, exploring, geothermal energy, geophysics research and mining, at depths beneath the earth that cannot be reached with conventional drilling methods.

Development of the electric subterrene is progressing, but work has not yet begun on the nuclear version. Present concepts are to use a compact high-temperature nuclear reactor whose thermal energy would be transferred to the pene-

trator through heat pipes. Since LASL scientists invented and continued the development of both the subterrene and the heat pipe, and have pioneered in the development of high-temperature nuclear reactors, the nuclear subterrene is a natural extension of the Laboratory's capabilities. With the funding of a large scale project, the scientists feel the subterrene could be used for some short term applications as development progresses and that subterrene technology could be fully developed within 10 to 15 years. 

Herbert Anderson Named Laboratory Fellow

Professor Herbert Anderson of the University of Chicago has been named a Fellow of the Los Alamos Scientific Laboratory.

A physicist, Anderson has been associated with LASL in various capacities since 1944. He was an employee of the Laboratory from 1944-46 and later served as consultant and visiting staff member. He is presently a member of the LAMPF Policy Board.

Anderson was born in New York City in 1914. He received the B.A. degree in 1935 and the Ph.D. in 1940—both from Columbia University. He was engaged in nuclear chain reaction research at Columbia from 1940 to 1942 when he joined the staff of the University of Chicago. He was a key mem-



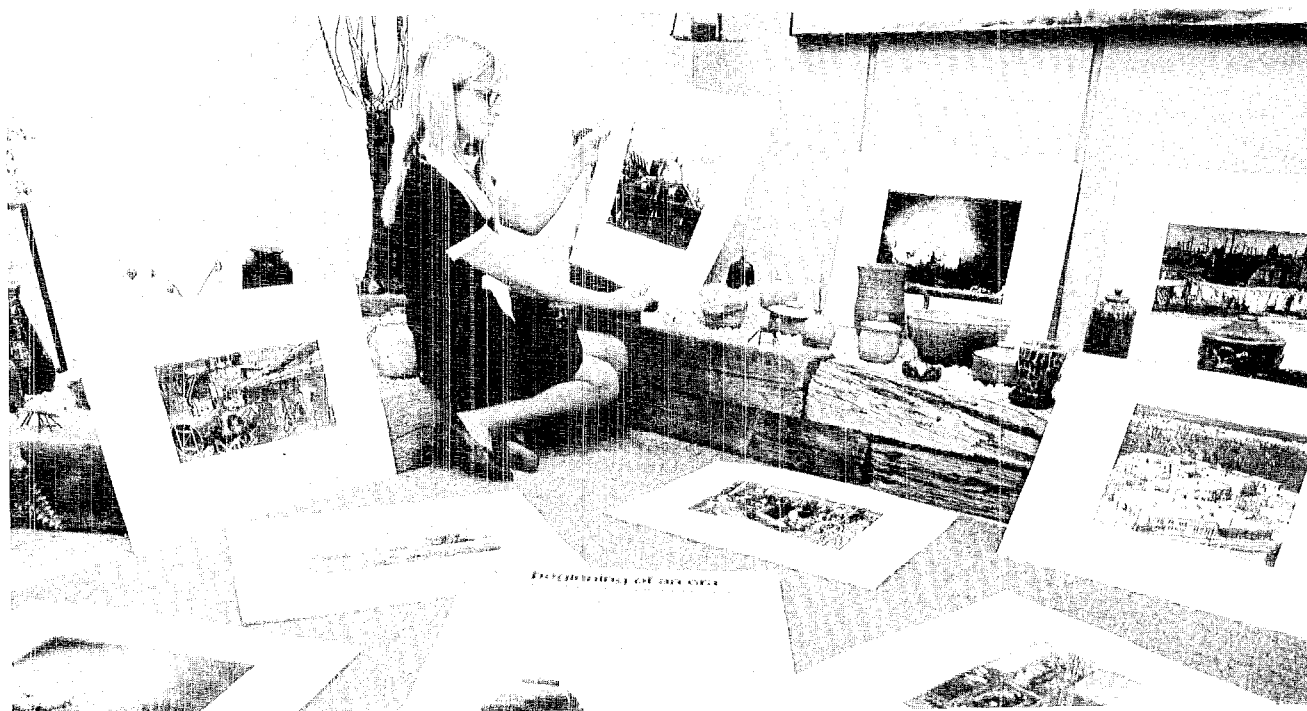
ber of Enrico Fermi's team that first initiated a self-sustaining nuclear chain reaction and controlled it on Dec. 2, 1942. Anderson came to Los Alamos in 1944 to work on the Manhattan Project and after the war rejoined the University of Chicago.

He was a Guggenheim fellow, 1955, Fulbright scholar in Italy, 1956, and director of the Enrico Fermi Institute for Nuclear Studies, 1958-63.

Anderson is a Fellow of the American Physical Society and a member of the National Academy of Sciences.

His appointment as a Fellow of LASL is the fourth in the new staff category created by Harold Agnew, Laboratory director. Named earlier were Bernd Matthias, Anthony Turkevich and Gian-Carlo Rota.

It is expected that between five and seven outstanding scientists will eventually be at LASL in this capacity. The appointment can be held for an unspecified period of time. ✻



Corry Clinton, PER-7, is originally from The Netherlands and still has family there. About a year ago, she sent her brother, Piet Fioole of Breta, some Laboratory publications. Fioole made silk screens of some of the photographs in them and mailed five of the prints to Mrs. Clinton. He

displayed a dozen others in Breta and recently sent these to his sister too. In this photograph, taken at the Gallery Plus in Los Alamos by Bill Jack Rodgers, ISD-7, Mrs. Clinton shows a portion of the 17 silk screens of Los Alamos scenes she has received from Fioole to date.

LASL Builds Magnetic Pinch Machine for Smithsonian Institution

At the request of the Smithsonian Institution, an exhibit to demonstrate the forces of magnetic fields has been built by scientists working on the Sherwood Program, America's endeavor to produce electrical power through controlled thermonuclear (fusion) reactions.

In principle, the exhibit is much the same as the magnetic pinch machine at the Laboratory's Bradbury Science Hall which uses a magnetic field to suddenly "pinch" the ends of a cylinder of aluminum foil to form a "magnetic bottle." The exhibit was designed several years ago by Alfred Schofield and Bob Holm, both of P-14.

The principal builders of the new machine are Bob Dike and Grenfell Boicourt, both of P-16. They were assisted by Harry Snowden, Charlie Charlton and Milton Hollen, also of P-16.

The electronics of the new machine are contained in an attractive wood cabinet which has a glass cage at the top for viewing. When a Smithsonian visitor puts a 25-cent piece in the coin slot, the quarter completes an electrical circuit which starts to charge the machine's capacitor. Inside the glass cage, a red light indicates the ca-

pacitor is charging and a meter shows the charge. When the meter needle reaches about five kilovolts, a bell rings to indicate charging is completed. Then an aluminum tube drops from a supply rack, slides down a short chute and into a transparent cylinder. There is a "bang," about as loud as a small firecracker, and the tube drops through the floor of the glass cage into a slot where it can be picked up by the visitor.

The aluminum cylinders are actually toothpaste tubes taken from a manufacturer's assembly line before one end is crimped and the necks and caps are added to the other. The machine's supply rack will hold about 75 of them. These are being made available to the Smithsonian Institution by the manufacturer for about eight cents each. The quarter inserted by the Smithsonian visitor will be used to offset the cost of these tubes, power requirements, and machine maintenance and repairs.

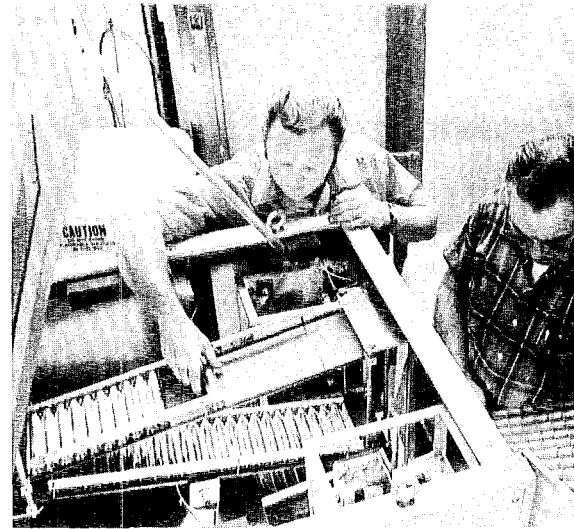
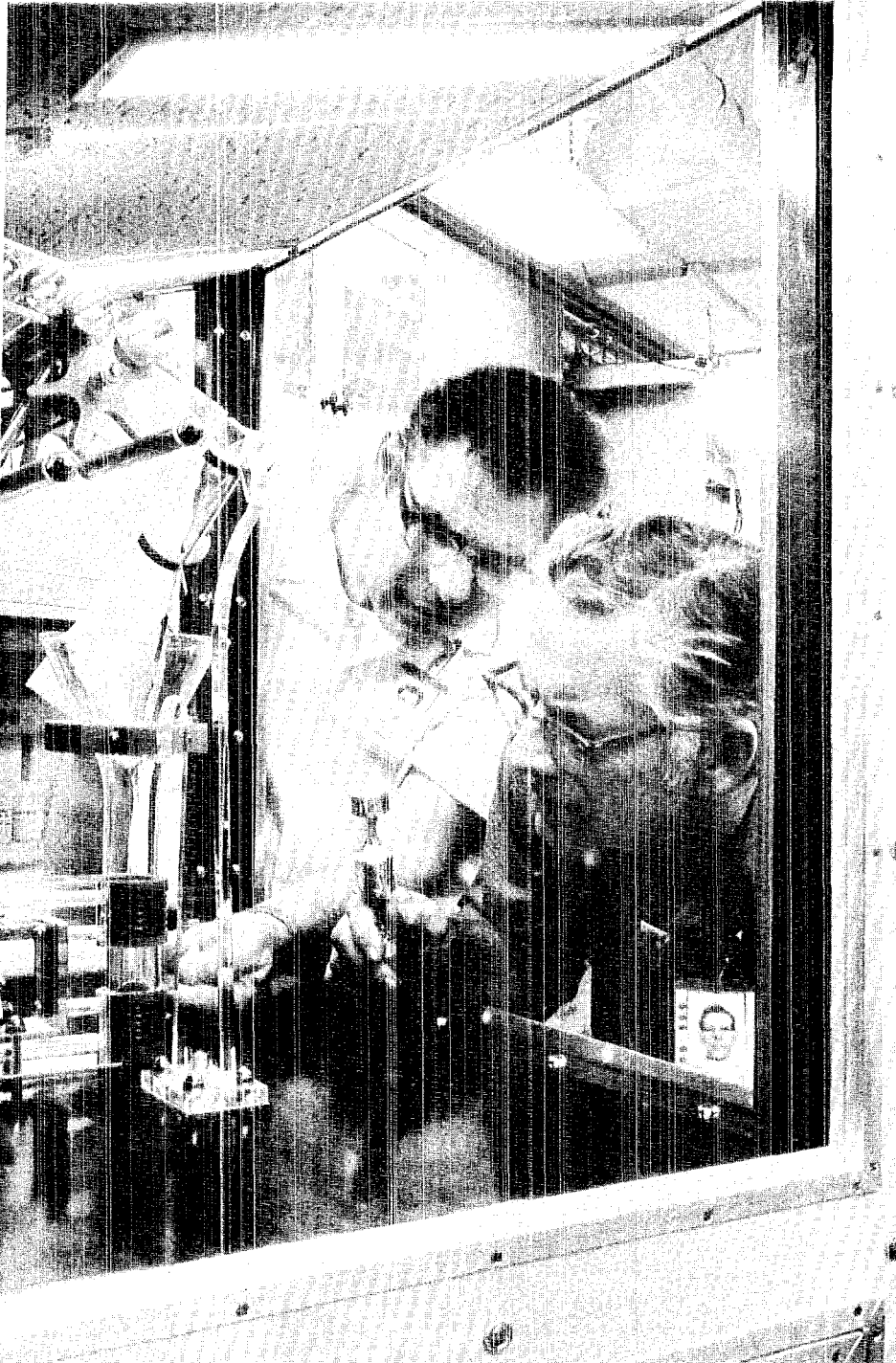
The product generated by the Smithsonian machine is an aluminum tube pinched near each end, a tangible souvenir of the forces that can be applied by magnetic fields, the same phenomenon used

by Sherwood scientists for squeezing plasmas.

To make power from a controlled thermonuclear reaction it is necessary to heat an ionized plasma of deuterium and tritium to an enormous temperature and confine it in a magnetic bottle for a short time. One way of doing this—the Scylla-Scyllac theta pinch—squeezes the plasma together by means of a magnetic field from a pulse of many millions of amperes in a coil wrapped around the plasma.

Once the technique for making these pulses had been developed, it was soon realized that magnetic fields could be used for other purposes, such as for squeezing metal tubes or rings. This realization resulted in spinoffs from the Sherwood Program known as Magnetic Forming and Magnetic Forging.

These spinoffs are now in use commercially. For example, in some automobile plants, high pressure hoses are attached to nipples by placing loose-fitting rings around the joints. A coil is placed around the ring and a magnetic field applied which suddenly shrinks the ring around the hose in a permanent grip without a wrinkle. ❀



Charlie Charlton and Harry Snowden, both of P-16, load the machine's supply rack with aluminum cylinders.

Grenfell Boicourt and Bob Dike, both of P-16, make adjustments on the magnetic pinch machine which was built for the Smithsonian Institution.

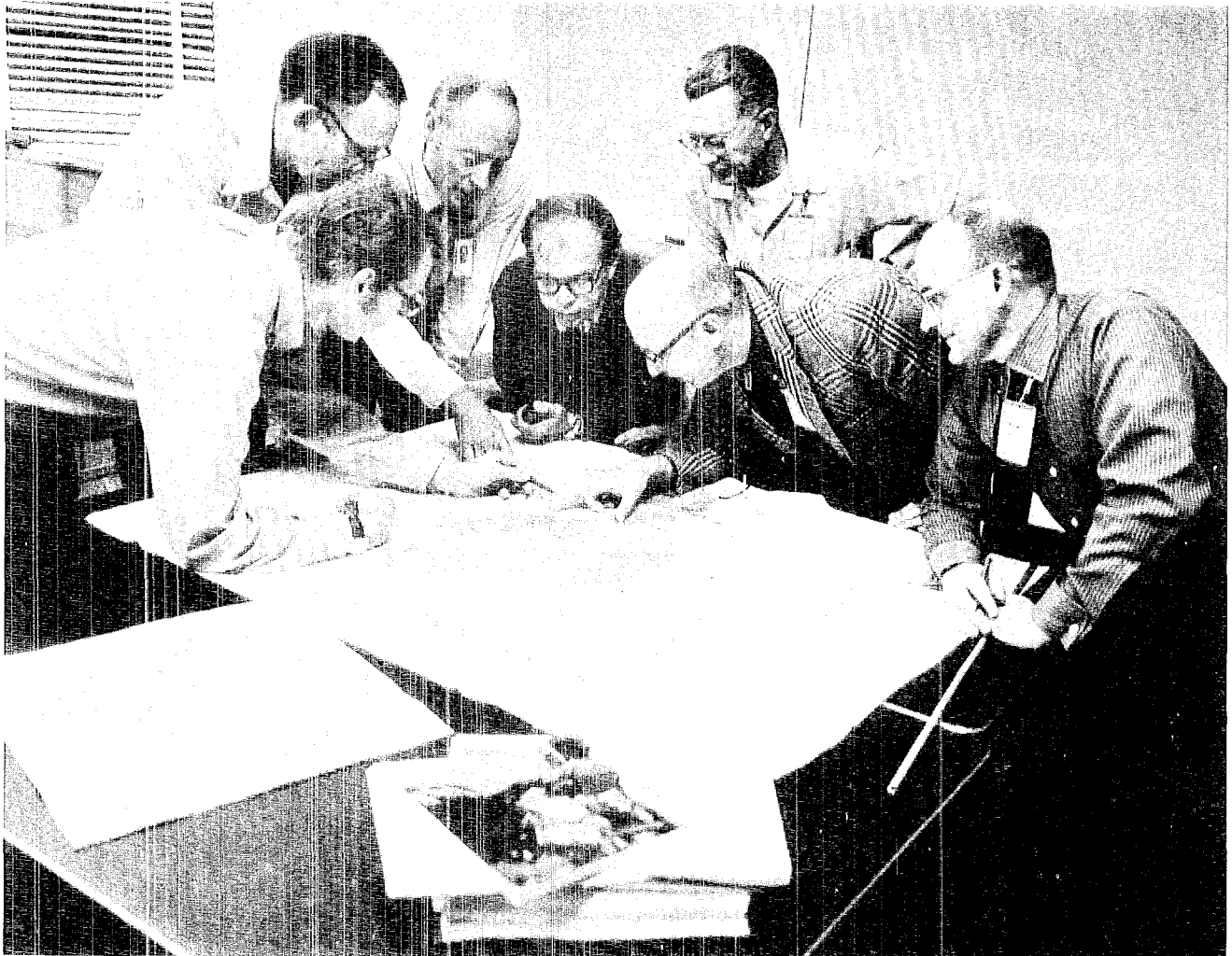
Geothermal Energy for Electric Power?

The production of electrical power to meet the demands of users in the United States has doubled each decade since 1940. In 1970, power companies produced 1,529 billion kilowatt-hours of electricity, enough to light more than 15 trillion 100-watt light bulbs for an hour.

In order to continue meeting the growing demands for electricity, new methods of producing it will be required. Fuel-burning power plants now provide most of our electricity and will continue to do so for many years to come. However, these plants consume vast amounts of coal and oil whose limited resources will eventually be depleted. In addition, they are under increasing attack by conservation groups concerned about environmental pollution. The number of rivers suitable for the installation of more hydroelectric plants will soon be exhausted. Nuclear (fission) power plants are being built, but it will be many years before there are enough of them to supply the country with its electrical needs. The rate of growth of the nuclear power industry is being hampered by some public skepticism and thermonuclear (fusion) power is still in the research and development stages. There are also several geothermal energy plants but these are limited to certain locations—mostly in the western states—where there are underground reservoirs of water heated by molten rock. Steam rising from these hot-water reservoirs is intercepted by wells and used to drive the turbines of electric generating plants.

A group of scientists at the Los Alamos Scientific Laboratory is proposing an experiment to demonstrate that geothermal energy power plants need not be confined to areas where there are underground hot-water reservoirs. They believe it may be possible to extract heat from dry, but hot regions in the earth and convert it to electrical energy. The proposal is based on the fact that the earth's temperature increases with depth. On the average, this geothermal gradient is about one degree Fahrenheit every 100 feet, but it varies widely from place to place and is significantly higher in areas where there has been recent volcanic activity. In these areas there are high temperatures available at relatively shallow depths that can be reached with present-day drilling capabilities.

One such volcanic area is the Jemez Caldera, the remnant of a huge, extinct volcano near Los Alamos whose magma chamber is thought to extend several miles beyond the rim of the caldera. The scientists are suggesting that an experiment be conducted over the periphery of the magma chamber on government-owned land west of S site



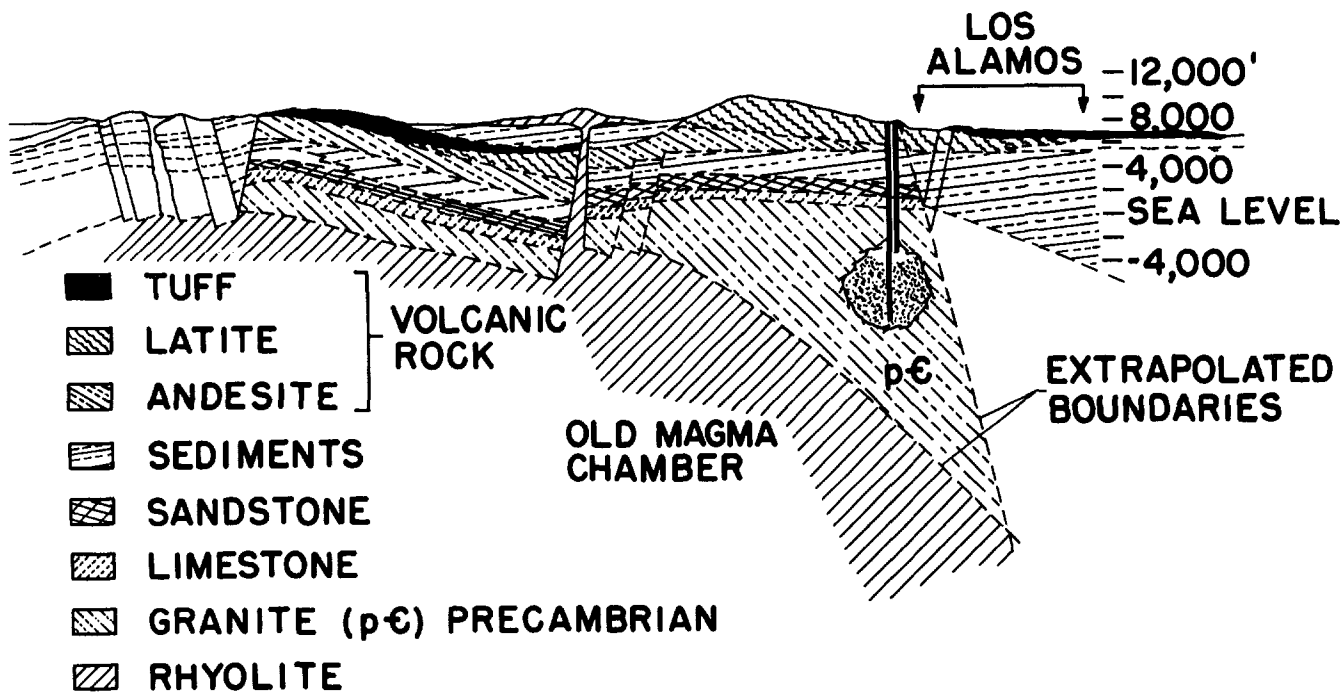
Looking at a map for possible sites of the proposed geothermal energy experiment are Don Brown, N-7; Bob Potter, CNC-4; Bob Mills, P-8; B. B. McInteer, CNC-4; John Rowley, N-7; Morton Smith (behind Rowley), CMB-13; and Dale Armstrong, CNC-4.

at the base of Sierra Grande Mountain. Here a hole would be drilled, not into the magma chamber, which is many thousands of feet below the earth's surface, but to such depth as would be required to take advantage of some of the heat conducted toward the surface through adjacent rock. The heat required to conduct the experiment would be about 600 degrees Fahrenheit. The scientists anticipate this temperature can be attained at the bottom of a hole about 15,000 feet deep.

The hole would be drilled with a conventional oil-well drilling rig. These have been used to drill holes on the order of 25,000 feet deep.

Near the bottom of the bore hole, hydraulic fracturing would be used to form cracks in the adjacent rock to provide a large heat-transfer surface. Hydraulic fracturing is commonly used in the petroleum and natural gas industries. The cracks created by it facilitate the flow of crude

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The proposed geothermal energy reservoir is shown in this schematic along with rock formations. The illustration was adapted from U.S. Geological Survey Map I-571.

petroleum or natural gas from surrounding formations into the well.

In an area about 1,200 feet from the bottom of the hole, the well casing would be perforated and temporary seals would be inserted just above and below this area. A fluid would be pumped through the upper seal at high enough pressure to fracture the rock adjacent to the sealed area to form a fractured region the shape of a pancake on edge with a radius of about 1,500 feet.

The crack system would be intersected by a second hole drilled 20 to 30 feet from the first. Water would be pumped down the first hole. It would be circulated through the underground fracture system where it would be heated and then forced up through the second and shallower hole to the surface. Here the heated water would pass through a heat exchanger capable of removing 150 megawatts of thermal energy. The cooled water from the heat exchanger would be introduced to the first hole. Once a moderate temperature difference had been established between cold water descending in the first hole and hot water rising in the second, circulation through the system would be maintained by natural convection. Pumping would be discontinued except for injection of any additional water required to keep the system full.

Small amounts of additional water would be needed to keep the system full as thermal-stress cracking progressed. Like most other solids, rock contracts as it cools. As thermal energy is removed from the hot rock in the fractured zone, the rock will tend to shrink and is expected to cause new cracks that will reach far beyond the cooled region. This thermal cracking would expose new heat-transfer surfaces. Since thermal-stress cracking would be expected to proceed downward more than upward, hotter water would become available to a power plant at the surface. This would not only extend the useful life of the plant, but, as thermal-stress cracking progressed, the increase in hot-water temperature would also allow greater amounts of electrical energy to be produced.

Considering just the hydraulically fractured area of the experimental system, the thermal energy potential would be about 260 megawatts. If thermal-stress cracking occurs as it is expected to, the lifetime of the reservoir could be extended for as long as 30 years and a power plant to take advantage of the 260-megawatt potential could be used to produce 40 to 60 megawatts of electrical energy.

The merits of a geothermal energy system of this type are uncertain at this point. The advantages of such systems for production of electrical power are more easily predicted than the disadvantages, and only an experiment such as proposed by the IASL scientists can provide the information necessary to weigh one against the other.

Ideally, self-perpetuating power plants such as these would provide pollution-free, inexpensive power for a long time. As new drilling, hydraulic fracturing, and exploitation techniques are developed and improved, it should be possible to extract thermal energy even where the geothermal gradient is average simply by drilling deeper holes.

Realistically, these expectations are based on current technology and have been substantiated by computer modeling which has been used to predict the behavior of the theoretical geothermal system with time. An experiment with an elaborate monitoring system is needed to verify these calculations, to resolve some problems the scientists predict could possibly occur, and to discover and resolve any unforeseen problems.

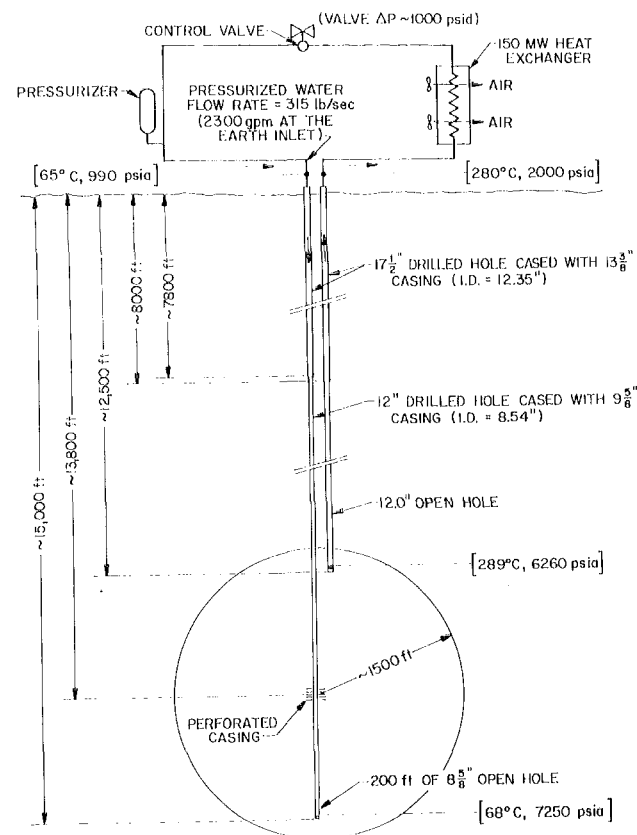
Calculations show that thermal energy from a hydraulically fractured reservoir of the size proposed for the experiment would be depleted in about 10 months. Depletion would be accompanied by a power decay as the reservoir rock

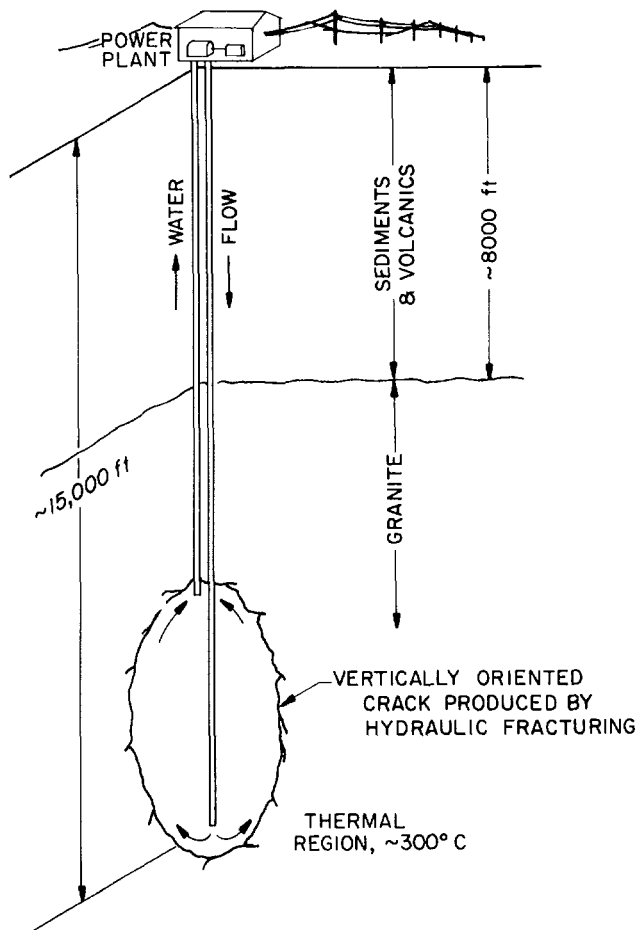
cools and cracks. Thermal-stress cracking would open up new heat-transfer surfaces to water being injected into the system. When this occurred, there would be a power recovery which would gradually reach and eventually exceed the thermal energy of the hydraulically fractured reservoir and extend the productive lifetime of the geothermal energy plant.

Drilling in hot, igneous rock, however, is relatively slow, difficult and expensive by conventional methods. Modifications of the method may be required when temperatures in excess of 600 degrees Fahrenheit are encountered, although reputable drilling firms contacted are confident that the required holes can be drilled without major difficulty and at reasonable cost.

Hydraulic fracturing is normally done only in sedimentary rock by petroleum and natural gas companies. But, the strength and elastic properties of some sedimentary formations approach those of

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igneous rock. Representatives of a commercial hydraulic-fracturing concern feel that the fracturing required for the geothermal energy project can be done without difficulty using standard techniques.

Soluble minerals contained in the circulating water may require separation or chemical treatment to avoid clogging and corrosion of piping and heat exchanger tubing. Since many minerals have commercial value, their recovery from the circulating water could be profitable.

There is no indication that the underground crack system would increase seismic activity or that collapse or abandonment would result in surface cratering, although both possibilities would be investigated in the course of the experiment using sensitive seismic instrumentation. In addition an array of acoustical devices would be used to monitor the minor seismic disturbances expected to accompany hydraulic fracturing and the fracture pattern would be mapped as completely as possible. These same devices would be used to monitor the progress of thermal-stress cracking and correlations would be attempted to determine such changes in reservoir properties as volume and heat content.

The geothermal energy proposal grew out of the nuclear subterrene project which is aimed at developing a device that can melt its way through rock. Actually, it was one of the several applications proposed for the subterrene and still may be if the geothermal energy experiment is successfully completed. It was realized, however, that geothermal energy from hot-rock areas could be demonstrated much earlier if conventional drilling methods were used rather than waiting for the development of the nuclear subterrene. For this reason, and in view of the search for new sources to meet future electrical needs, the geothermal energy project is being proposed separately.

Because of this relationship, many of the scientists participating in the geothermal energy project are the same as those in the subterrene program. These include Morton Smith, CMB-13; Bob Potter, Dale Armstrong, B. B. McInteer and Eugene Robinson, all of CNC-4; Don Brown and John Rowley, both of N-7; and Bob Mills, P-8. Other scientists involved in the geothermal energy program are Frank Harlow and Bill Pracht, both of T-3; and Lee Aamodt, J-DO.

If the geothermal energy project is funded, heat extraction could be only a few months away. Detailed information to determine the feasibility of the system would follow over the next three to four years.

LAMPF Beam Time Assigned to 61 Experiments



At the recent annual meeting of the Users Group, Louis Rosen, director of the Los Alamos Meson Physics Facility, publicly announced for the first time that accelerator beam time has been assigned for 61 experiments.

The Users Group is made up of scientists from colleges, universities and research laboratories throughout the United States and some foreign countries who will share use of the facility with the Los Alamos Scientific Laboratory.

To the 230 members of the Users organization in attendance, Rosen said, "We are presently operating on the assumption that our Fiscal Year 1973 operating budget will be honored in full, experiments will start early in Calendar Year 1973 and not more than 50 per cent of the accelerator time will be required for accelerator repair, maintenance and improvement during Calendar Year 1973. Under these assumptions we assume an average of 3,000 hours available on each channel. We have so far been rather conservative in the assignment of beam time, partly because we do not wish to close off the availability of beam time to new experiments at such an early date. As a consequence, we have assigned beam time only to those experiments which fulfill at least one of the following criteria:

"(1) They are parasitic experiments and require neither dedicated beam time nor other LAMPF resources.

"(2) They are obviously first generation experiments which must be initiated in order to establish the feasibility and desirability of whole classes of experiments.

Members of a summary discussion panel at the LAMPF Users meeting included Laboratory Director Harold Agnew, Executive Committee Chairman Gerald Phillips, Chairman-Elect Kenneth Crowe, and LAMPF Director Louis Rosen.

"(3) They are of such overriding importance that they should not be delayed once beam time and facilities are available.

"(4) They require very long lead time in preparation and also have high priority in the overall program."

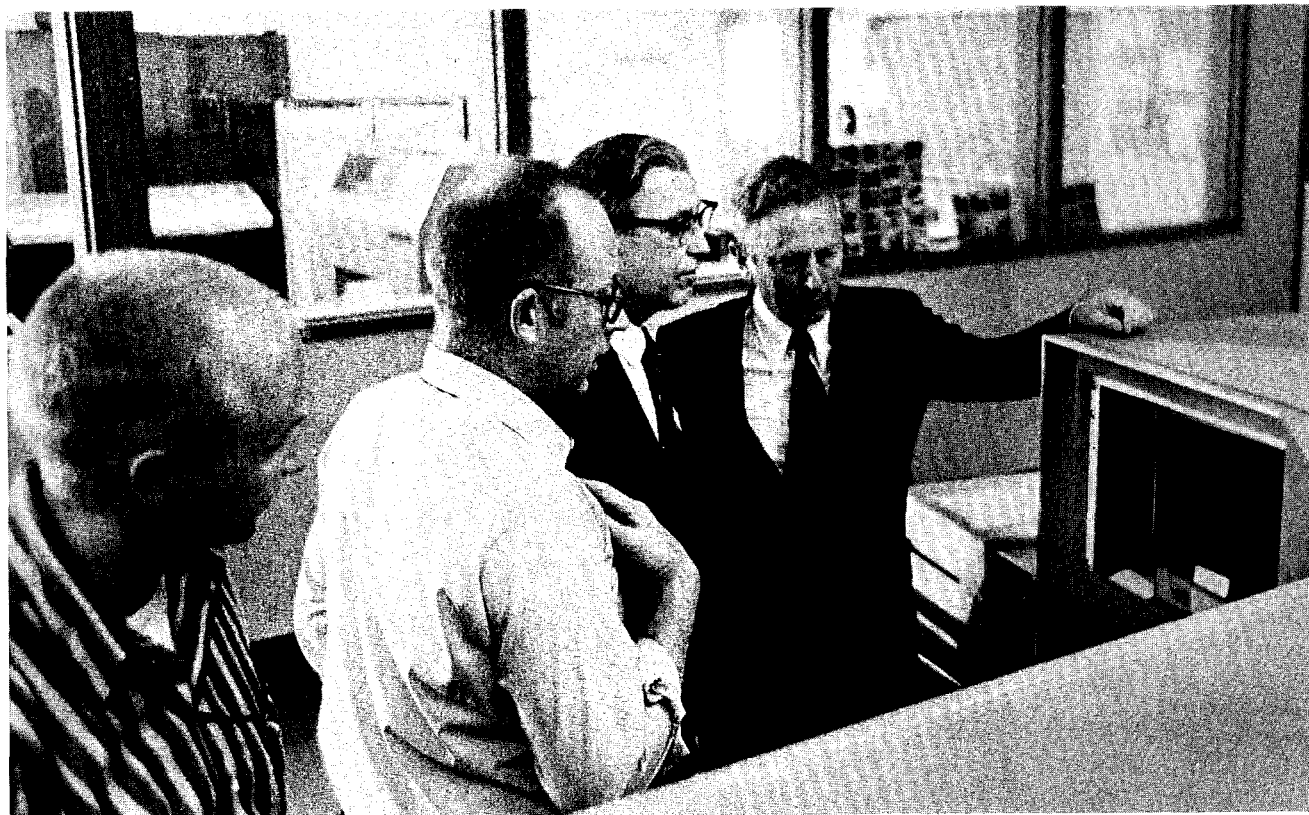
Proposals are submitted to the director of LAMPF. Preliminary processing is carried out by the director and other members of his organization to judge their overall practicality. The organization may suggest revisions which will help experimenters to better utilize LAMPF resources or they may be forwarded to the Program Advisory Committee.

The Program Advisory Committee examines proposals and evaluates them in light of their scientific merit and feasibility. It recommends to the director either acceptance or rejection. It may also recommend priorities for those found acceptable and modifications which would require the submission of a revised proposal.

"We have 109 proposals for experiments involving a total of 291 different investigators from 66 institutions," Rosen told the group.

"The Program Advisory Committee has studied and made recommendations on almost 100 proposals. I have been responsive to more than 90

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Touring the LAMPF Operations building is Paul McDaniel (second from right), director of the Atomic Energy Commission's Division of Research. McDaniel was the key speaker at the Users Group banquet. Others are Ken Crandall, MP-4, Don Swenson, MP-3, and Rosen.

per cent of their recommendations and have deviated only where dictated by budgetary or scheduling realities. The PAC addresses itself to three questions whenever a proposal is before them. These are: Why? Who? and How? And in that order of importance. Why should a given experiment be done? Who is proposing to do it and what are their credentials? And, how shall the experiment be accomplished, including the time scale and total LAMPF resources required? For all approved experiments, the last question will be explored much more thoroughly by local staff as beam time approaches.

"The question of prime interest to you, as Users, is not whether we shall see a few 800-MeV protons next July, but whether we will be able to meet our goal of initiating an experimental program early in Calendar Year 1973. I believe the answer to this question is still affirmative, provided our projected budget for Fiscal Year 1973 is implemented as it now stands.

"No better evidence for the interest and enthusiasm of LAMPF Users can be found than the composition and activities of the large numbers of working groups which have organized themselves under the charter of the LAMPF Users Group.

"... it is crystal clear to me that start-up of LAMPF cannot be justified to the scientific community in any context save that of a national facility. This feature, plus the practical applications potential of LAMPF, appears absolutely essential to the support of LAMPF by the Congress and by the Executive agencies. Fortunately, these objectives have been paramount in our thinking from the very beginning. We have, in fact, made very great efforts to bring the prospective Users of LAMPF into the decision-making process as it concerns the experimental capabilities of this facility. Your advice and council have figured prominently in establishing the performance specifications for every major experimental capability at LAMPF. Our budgets and how we used them are an open book, for all of you to read and criticize; and I assure you that your criticism is heard and studied and acted upon. The setting of priorities on experimental proposals is being done by utilizing the well-tried process of peer-group review and recommendation.

A White Christmas... The Hard Way

Editor's Note: Normally, "The Atom" doesn't reprint articles, but just this once, we're going to break the rule. We find there are several ways to justify reprinting "A White Christmas . . . The Hard Way!" First of all, it involves the Los Alamos Meson Physics Facility. Secondly, it's nearing Christmas. Thirdly, it is indicative of the Laboratory's requirements for special products and, fourthly, we think you'll enjoy reading it. It is reprinted from the "NEW-TRON," Volume 6, Number 1--house organ for Reactor Experiments, Inc., San Carlos, Calif.

Since our firm is located in the San Francisco Bay Area of California, it is reasonable to expect that we would not encounter many, if any,

white Christmasses (Chrismases? Christmassi?). However this year we are **not** particularly pleased to say, we have had a "white" Christmas to end all white Christmasses (see above for spelling). In this case the white was not due to the appearance of the beautiful snowflakes that one usually identifies with the winter, but was associated with thousands upon thousands (actually one hundred thousand) pounds of a special plaster material. We are prepared to state that 100,000 pounds is a lot of **anything** and in this case 100,000 pounds of plaster is a surfeit, to put it mildly.

The situation all came about when in a mo-

continued on next page



Agnew explains the Laboratory's organization structure to members of the Users Group.

"All these things we are doing out of a sense of responsibility, not expediency. Our efforts toward realizing practical applications of LAMPF are similarly motivated. I hope that shall always be so.

"The impact which LAMPF is having on our society is already noteworthy. It has brought together and set in coherent motion, a large part of the nuclear science community and is helping to revitalize the partnership between the academic community and the Federal establishment. It promises to show the way towards the application of pions and muons in medicine, and to make available families of radioisotopes heretofore not within our reach. Drastic improvement in the technology of producing megavoltage x rays is already a byproduct of LAMPF development, and great men of medicine are already being attracted to this area of the country so that they can better participate in realizing the promise of LAMPF in therapeutic and diagnostic medicine. Such is the nature of the enterprise of which you are the essential ingredient."

The Users group now numbers more than 750 members from more than 200 institutions. Newly elected officers of the organization's executive committee are Kenneth Crowe, University of California at Berkeley, chairman; Mark Jakobson, University of Montana, chairman-elect; George Igo, University of California at Los Angeles; Lee Northcliffe, Texas A & M; and Chaim Richman, IL-9 group leader at LASL.



ment of weakness we agreed to submit a bid to Los Alamos Scientific Laboratory on a rush job for low cost shielding to line the outside walls of an underground tunnel they were building. This is the tunnel that contains the major portion of the new Meson Facility at Los Alamos. In order to stop streaming of neutrons through the concrete walls of the tunnel, it was desirable to line them with a boron-containing material. We developed such a material and were able to fabricate it in the form of sheets 2 feet x 3 feet x 1 inch thick. It really didn't turn out to be too difficult in the laboratory where you were working with a 5 pound quantity. However when we went into production, it turned out to be a horse (or herd if you will) of a different color.

In our own naive way, we started production but soon became aware that there might be a few problems. The product turned out quite well but we started to accumulate a nice, fine white powder all over the walls, the ceiling and especially the floor. From the floor, of course, it got on the bottom of people's shoes and thence to our offices, eating spaces, rest rooms, automobiles and ultimately to our homes. About the only thing we can be thankful for is that the material was not radioactive. Everyone (including the secretaries) breathed a sigh of relief when the order was finally shipped out—on five, count them, five huge trucks, only three weeks after receiving the order.

Unfortunately there was one little memento left by this new shielding material which we had not anticipated. During the production run, we found that we had to wash out all of the equipment between each batch that we made. In the course of each day, we seemed to accumulate something like 300 to 400 gallons of milky, white water which apparently had no intention of settling down. The excess ran off into the street, down the block, around the corner into the storm drains. After about a week, we had a very unhappy gentleman from the city stop by and tell us that the entire street was white—what were we putting into their sewers? Along with this all the automobiles parked on the block were getting white on their tires and tracking it all over town. We assured the unhappy public servant that the material was non-toxic and that we would immediately stop coloring his pavement. There were a few

other little incidents such as truck drivers going by and shaking their fists and mumbling epithets about ecology. In any case, the result of this was to build up our supply of milky water even faster. There was a large vacant lot across the street so our next step was to dump some of the excess material into this lot, since we had observed other people dumping things there at various times. Unfortunately a white, slimy film began to build up on the top of the lot and with the rains that you may have heard we occasionally get in California, it was getting sloppier and sloppier. We began to suspect that the owners of the lot were not too happy about this situation when one day a truck suddenly drove up and started to install a high steel fence around the lot.

We were now getting desperate. We had been trucking barrels of the material down to the dumps but this was a very slow and inefficient process especially when thousands of gallons were involved. Our next step was to dig a large hole with a bulldozer in a nearby yard that we were leasing. We dumped the material in that and it worked out quite satisfactorily aside from having to cover up this gigantic hole whenever the rains started to prevent it from filling up excessively. This was working out quite well except for the fact that we almost lost a couple of employees who started to sink in this white quicksand marsh. In any case the rains finally stopped for awhile. Our final salvation finally came at the hands of the Roto-Rooter people who drove up in a large truck with a powerful vacuum system and tank ordinarily used for emptying septic tanks. As an anti-climax, they completely drained the swamp within an hour, took the material out and got rid of it—God knows where. We are not even going to ask them what they did with it. At the time of this writing all that remains to be done is to fill up the gigantic hole in the ground before the gentleman from whom we are leasing the lot sees it.

We apologize for burdening you with the above Christmastime horror story, but we do want to let you know that we will actually accept orders for borated plaster shielding as long as it is in small quantities. We will absolutely not accept any orders for 100,000 pounds of this material.



short subjects

LASL, AEC, ZIA and County officials will participate in an Emergency Planning Workshop the week of Dec. 6. The purpose of the workshop is to develop a Los Alamos County Emergency Operations Plan. The sessions will be conducted by the University of New Mexico Civil Defense Extension Staff under contract with the Department of Defense. **Robert Porton**, Los Alamos civil defense director, has named Deputy Director **Mayo Pacheco** to direct the exercise. All activities will be held in the basement center of the County Municipal building.



William Lyons, W-9, has been elected a full member of the International Institute for Strategic Studies, London.

The total international membership of the Institute is approximately 800 with about 230 of these from the United States. The organization is most noted for its prognostications pertaining to the balance of world strategic power.

Lyons is the only full member from LASL. His work at LASL includes analysis associated with new concepts in U.S. strategic weapons systems.



Ten Los Alamos scientists have been appointed Fellows of the American Institute of Chemists, according to **Charles Holley, Jr.**, CNC-2 group leader and president of the New Mexico Institute of Chemists.

Receiving appointments were **Philip Armstrong**, CMB-13; **Benjamin Barnhart**, H-4; **Harold Burnett**, CMB-1; **M. Duane Enger**, H-4; **Claude Herrick**, CMB-13; **Darryl Jackson**, CMB-1; **Jerry Kerrisk**, CMB-11; **Homer Lewis**, CMB-13; **E. Dan Loughran**, GMX-2; and **Norris Bradbury**, former LASL director.

Fellowships are awarded in recognition of outstanding contributions to the fields of chemistry and chemical engineering.



Gordon Chappell, former GMX-3 employee, died at the Los Alamos Medical Center. He is survived by his daughter, Mrs. Linda Parsons, La Canada, Calif.

The Bradbury Science Hall has resumed weekend operations on a limited basis. The Hall is open Saturday and Sunday afternoons from 1 to 5 p.m. Because of cost limitations, the facility has been closed on weekends for several months.



The U.S. Forest Service has designated three areas where Los Alamos residents can cut their own Christmas trees. They are Clara Peak Road, St. Peter's Dome and Thompson Ridge.

Permits and maps showing exact boundaries of the tree cutting areas are available at the Forest Service office in Los Alamos. It is located in Room 123 of the Atomic Energy Commission building.

In addition to normal workdays, the Forest Service office will be open from 8 a.m. to 5 p.m. Dec. 4-5, 11-12 and 18-19.

Cost of permits will be \$1 for trees up to eight feet.



Certificates and \$25 checks were presented to seven scientists by Laboratory Director **Harold Agnew** in honor of the spin-off applications of their inventions. All of the awards presented were as a result of work done in Project Rover.

Recipients were **Keith Boyer**, J-DO; **John Bartlit**, **Ken Williamson** and **John Bronson**, all of P-8; **Harry Otway**, J-DO; **Roy Reider**, H-3; and **H. L. Knight**, a former LASL employee.

The awards were made under the Technology Utilization Program which is jointly sponsored by the Atomic Energy Commission and the National Aeronautics Space Administration. The inventions were released in the form of technical briefs to the public for commercial use.



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the technical side

Taken from LASL Technical Information
Reports submitted through ISD-6

Second Laser Interaction and Related Plasma Phenomena Workshop, Rensselaer Polytechnic Institute, Hartford, Conn., Aug. 30-Sept. 3:

"A Classical Resonance in the Optics of Thin Films at the Plasma Frequency" by R. P. Godwin, W-10

Muon Physics Conference, Department of Physics, Colorado State University, Ft. Collins, Sept. 6-10:

"With What Does the Muon Interact?" by J. L. Gammel, T-9

Gull Lake Symposium on the Two-Body Force in Nuclei, Gull Lake, Mich., Sept. 6-10:

"Some Basic Questions in Nucleon-Nucleon Bremsstrahlung" by L. Heller, T-5

Fourth International Conference on High Energy Physics and Nuclear Structure, Dubna, USSR, Sept. 7-11:

"A New Quantity in Nuclear Muon Capture by Radiochemical Techniques" by R. R. Silbar, T-9

"Nuclear Chemistry Program for the Los Alamos Meson Physics Facility" by B. J. Dropesky, CNC-11

"Dispersion Relations for Nuclear Structure Physics" by L. S. Kisslinger, LASL consultant from Carnegie-Mellon University, Pittsburgh, Pa.

International Conference on Atomic Collisions in Solids — Physics of Channeling and Related Phenomena, Gausdal, Norway, Sept. 20-24:

"Measurements of Interatomic Potentials and Multiple Scattering in Thin Crystals Using Proton-Channeling Studies with a Super-Collimated Beam" by D. D. Armstrong, P-12, W. M. Gibson, Bell Telephone Laboratories, Murray Hill, N. J., J. Golovchenko, Rensselaer Polytechnic Institute, Troy, N. Y., and A. Goland and H. E. Wegner, both Brookhaven National Laboratory, Upton, N. Y.

Conference on Cosmic Plasma Physics, European Space Research Institute, Frascati, Italy, Sept. 20:

"Thermal Energy Transport in the Solar Wind" by M. D. Montgomery, P-4 (invited)

Lecture, Biology Department, Highlands University, Las Vegas, N. M., Sept. 23:

"Monitoring for Radioactivity in the Environment" by H. S. Jordan, H-8

Joint Meeting of the Rocky Mountain Section, American Industrial Hygiene Association, and the Rio Grande Chapter, Health Physics Society, Albuquerque, N. M., Sept. 23-24:

"Respirator Cartridge Filter Efficiency under Pulsating and Steady Flow Conditions" by R. G. Stafford and H. J. Ettinger, both H-5

Eleventh Conference on Thermal Conductivity, Albuquerque, N. M., Sept. 28-Oct. 1:

"The Steady-State Approximation in Thermal Diffusivity Measurements on Heterogenous Materials" by J. F. Kerrisk, CMB-11

"Determination of High Temperature Viscosities for Hydrogen, Helium, Argon, Nitrogen, Neon, and Xenon and a Calculation of the Corresponding Thermal Conductivities" by F. A. Guevara, B. B. McInteer and M. Goldblatt, all CNC-4

Miami Valley Section, American Society for Nondestructive Testing Meeting, Miamisburg, Ohio, Sept. 28:

"Thermal Neutron Radiography—A New Materials Analysis Technique" by D. A. Garrett and R. A. Morris, both GMX-1

Interagency Committee on Excavation Technology, Federal Council for Science and Technology, Washington, D. C., Sept. 28:

"Applications Portion of Presentation on Subterrene" by R. M. Potter, CNC-4 (invited)

"Subterrene Concepts" by M. C. Smith, CMB-13 (invited)

"Concepts and Applications of the Rock-Melting Subterrene" by J. C. Rowley, N-7 (invited)

Seminar, University of Rome, Italy, Sept. 28-30:

"Current Solar Wind Research Using the Vela Spacecraft" by M. D. Montgomery, P-4 (invited)

Lecture, Lawrence Livermore Laboratory, Calif., Sept. 29:

"Plasma Focus" by J. W. Mather and P. J. Bottoms, both P-7

Symposium, "Lifetime of Rocket Propellants, Gun Propellants, and Explosive Charges," Karlsruhe, Germany, Sept. 29-Oct. 1:

"A Comparison of Thermochemical Methods for the Determination of Kinetics Constants" by R. N. Rogers, GMX-2

Lecture, Federal Technical Institute, Swiss Institute for Nuclear Research, Zurich, Sept. 30; Massachusetts Institute of Technology, Cambridge, Oct. 6; and Northwestern University, Evanston, Ill., Oct. 11:

"Muon-Proton Scattering at Low Energies" by R. R. Silbar, T-5

Seminar, Department of Microbiology, University of New Mexico, Albuquerque, Oct. 1:

"Quantitative Measurements in Mammalian Cells" by D. F. Petersen, H-4 (invited)

Panel discussion on "Our Growing Power Crisis—Is Nuclear Power an Acceptable Solution?" sponsored by Student Branch, Trinity Section, American Nuclear Society, University of New Mexico, Albuquerque, Oct. 1:

"Energy Resources and Nuclear Power" by G. A. Graves, Dir. Off.

"Wastes from Chemical Reprocessing Plants for Reactor Fuels" by L. A. Emelity, H-7

"Environmental Effects of Producing Electrical Power by Nuclear Power Stations" by H. S. Jordan, H-8

"Licensing Process of Nuclear Power Reactors" by D. B. Hall, A-DO

Fifteenth Western Industrial Health Conference, San Francisco, Calif., Oct. 1-2:

"Variability Associated with Dispersion Features of Airborne Wastes" by R. V. Fultyn, H-8

New Mexico Sheriffs and Police Association State Convention, Farmington, Oct. 4:

"Explosives, Fun, Fact, and Forecast" by T. E. Larson and R. N. Rogers, both GMX-2

1971 Institute of Electrical and Electronic Engineers Thermionics Conference Specialist Conference, San Diego, Calif., Oct. 4-7:

"Effects of Fast-Neutron Irradiation on Ceramics and Ceramic-Metal Seals" by W. H. Reichelt, W. A. Ranken and A. J. Patrick, all N-5

"Implications of Ceramic-Insulator Irradiation Results for Thermionic Reactor Design" by T. G. Frank and W. A. Ranken, both N-5, and C. E. Backus, IASL consultant from Arizona State University, Tempe

Seventh Annual Test Measurements Symposium, Instrument Society of America, Chicago, Ill., Oct. 4-7:

"Effects of Nuclear Radiation on Ceramic Cemented Strain Gages and Polyimide-Encapsulated Epoxy Bonded Gages" by C. R. Tallman, N-4

Joint Working Group 28 Meeting, Atomic Weapons Research Establishment, Aldermaston, England, Oct. 4-8:

"Selecting Warhead Areal Support Materials" by C. A. Anderson, GMX-3

Colloquium, Northeastern University, Boston, Mass., Oct. 5, and Johns Hopkins University, Baltimore, Md., Oct. 7:

"The Los Alamos Meson Factory" by R. R. Silbar, T-5

Twenty-Fourth Annual Gaseous Electronics Conference and Third Arc Symposium, Gainesville, Fla., Oct. 5-8:

"The Kinetics of Electron Beam Controlled CO₂ Laser Systems" by A. M. Lockett, III, T-9

"Characteristics of an Electron Beam Controlled Plasma Discharge" by C. A. Fenstermacher and M. J. Nutter, both J-18, W. T. Leland, P-DOR, and K. Boyer, J-DO

"A Cold Glow Discharge Laser Energy Source" by C. B. Mills, T-DOT

"Current in the Cold Laser Plasma" by C. B. Mills, T-DOT, and J. Todd, Jr., GMX-7

"A Finite Difference Procedure and Computer Program for the Numerical Solution of the Boltzmann Equation for Energy Distributions of Electrons with Large Inelastic Scattering on Molecules" by J. H. Hancock and R. C. Jones, both C-4, and C. B. Mills, T-DOT

"Study of the A → X Transitions in CO⁺ and N₂⁺" by W. B. Maier, II, and R. F. Holland, both J-10

"Study of Light Produced by Collisions of Low-Energy He⁺ with N₂" by R. F. Holland and W. B. Maier, II, both J-10

"Emission from Long-Lived States of NO⁺" by R. F. Holland and W. B. Maier, II, both J-10

"Electron Transfer in Collisions of Doubly Charged Rare Gas Ions and Rare Gas Atoms for Primary Ion Energies Below 100 eV" by W. B. Maier, II, and B. Stewart, both J-10

"Charge Transfer and Ionization in Collisions between Atomic Ions and Rare Gas Atoms for Primary Ion Energies below 100 eV" by W. B. Maier, II, J-10

Second Annual General COMTEC Meeting, San Francisco, Calif., Oct. 6-8:

"COM Generated Color" by D. O. Dickman, C-4 (invited)

Conference on Two-Dimensional Digital Signal Processing, University of Missouri, Columbia, Oct. 6-8:

"Computational Considerations in Digital Image Enhancement" by B. R. Hunt, C-5

Meeting, Colorado Section, American Nuclear Society, Denver, Colo., Oct. 7:

"An Irreverent View of New Design Criteria" by J. R. Lilienthal, CMB-DO

1971 New Mexico Branch Meeting, American Society for Microbiology, New Mexico Institute of Mining and Technology, Socorro, Oct. 8-9:

"The Structural Alteration of Histones in Synchronized Mammalian Cells" by G. R. Shepherd, Billie Jean Noland and Julia M. Hardin, all H-4

"Phage Development in the Bacterium *Haemophilus Influenzae*" by B. J. Barnhart, and S. H. Cox, both H-4

continued on next page

"The ICONS Program at LASL" by C. T. Gregg and V. H. Kollman, both H-4

Meeting, Rio Grande Chapter of the Association for Computing Machinery, University of New Mexico, Albuquerque, Oct. 9:

"WATFIV and ALGOLW: Student Oriented Programming Languages" by F. W. Dorr, C-6

"The COBOL User in a Scientific Shop" by F. P. Welch, AO-7

"Bugaid, a Debugging Preprocessor" by Jennie Lee Boring, C-4

Ninth Rare Earth Research Conference, Virginia Polytechnic Institute, Blacksburg, Oct. 10-14:

"Electrochemical Reduction of Europium at a Porous Carbon Cathode with Flowing Electrolyte" by E. I. Onstott, CMB-8, and C. R. McClenahan, Northwestern University, Evanston, Ill.

"The Low Temperature Electrical Resistivities of Pd_3RE and PdCe Intermetallic Compounds" by R. O. Elliot and H. H. Hill, both CMB-5

1971 Institute of Electrical and Electronic Engineers International Electron Devices Meeting, Washington, D.C., Oct. 11-13:

"An Experimental Klystron for LAMPF" by P. J. Tallerico, MP-2

Data Processing Managers Association Meeting, Santa Fe, Oct. 12:

"PL/I for Data Processing Applications" by L. H. Baker, Jr., ENG-7

Wichita Section Meeting, American Nuclear Society, Wichita, Kan., Oct. 13:

"Plutonium Distribution as a Problem in the Environment" by W. H. Langham, H-4 (invited)

Nuclear Engineering Department Seminar, North Carolina State University, Raleigh, Oct. 14:

"Integral Testing of Nuclear Cross Section Data" by T. J. Hiron, TD-4 (invited)

E. C. Pollard Celebration Symposium, "Topics on Bacterial Structure and Function," University Park, Pa., Oct. 15-16:

"High Pressure Responses" by C. E. Hildebrande, H-4 (invited)

American Nuclear Society 1971 Winter Meeting, Miami Beach, Fla., Oct. 17-21:

"Criticality Considerations in the Nondestructive Assay of Nuclear Material" by D. B. Smith, R. A. Forster and M. M. Thorpe, all A-1

"Flux Optimization for a King Reactor" by F. T. Adler, LASL consultant from University of Illinois, Urbana, and K. D. Lathrop, T-1

"A Review of the Major Containment Systems in the U.S. Controlled Thermonuclear Research Program" by E. L. Kemp, P-16

"Electro-Optical Profilometer" by M. E. Lazarus, CMB-14, and T. Romanik, CMB-7

"Accurate Dosimetry of Low Energy X Rays" by P. B. Lyons and J. A. Baran, both J-14

"Socio-Economic Aspects of a Plowshare Experiment" by H. J. Otway, J-DO, L. van der Harst, CER Geonuclear Corp., Las Vegas, Nev., and G. H. Higgins, Lawrence Livermore Laboratory

"Determination of the ^{235}U Content of Low Enrichment Power Reactor Fuel Assemblies" by C. R. Weisbin, T-1, R. H. Augustson and A. E. Evans, both A-1, G. D. Turner, TD-6, and K. D. Boehnel, Karlsruhe Nuclear Research Center, Germany

"The Hydriding Reaction between Plutonium and Deuterium" by D. F. Bowersox, CMB-11

"Transformation Temperatures of Irradiated $\text{UO}_2\text{-PuO}_2$ Fast Reactor Fuels" by J. G. Reavis and J. L. Green, both CMB-11

"A Differential Thermal Analysis Apparatus for Observation of Irradiated Plutonium-Containing Reactor Fuels" by J. G. Reavis, CMB-11, G. R. Brewer and J. W. Schulte, both CMB-14, and D. B. Court, CMB-7

"Unreflected ^{235}U C_{182} Critical Assembly" by J. C. Hoogterp and G. E. Hansen, both N-2

"A Los Alamos Monte Carlo Criticality Code for Rover Reactor Calculations" by C. W. Watson, N-DOT

"Monte Carlo Simulation of Multi-group Transport Cross Sections" by D. R. Harris, T-2

"The King Reactor Concept, Dynamic Test and Safety Evaluations" by L. D. P. King, Dir. Off., and T. F. Wimett, N-2

"Calculations of ENDF/B Fast-Reactor Benchmark Cases Using the LASL-TD Cross Section Library" by T. J. Hiron, TD-4

"Versatile Containment Box System" by P. F. Moore, CNC-11

"Apparatus for Determining Heat Content on Irradiated Fuels" by C. E. Frantz, CMB-5

"The Use of High-Resolution Gamma-Ray Spectrometry for Detecting the Failure of Cladding in Encapsulated Fast Reactor Fuel Pins" by J. R. Phillips and G. R. Waterbury, both CMB-1, and J. W. Schulte, CMB-14

"Cross Section Compilation and Evaluation for Analysis of Concrete Shields" by P. G. Young, T-2, and E. T. Jurney, P-2 (invited)

"Comparison of ENDF/B Inelastic Scattering Data with Sphere Transmission Experiments" by M. E. Battat, T-2, and G. E. Hansen, N-2

Pacific Conference on Chemistry and Spectroscopy, Anaheim, Calif., Oct. 18-20:

"Quantitative Analysis of Carbon-13 by Infrared Methods" by R. S. McDowell, CNC-4

Fifth Materials Research Symposium, Washington, D. C., Oct., 18-21:

"Crystal Chemistry of Refractory Carbides" by A. L. Bowman, CMB-3

Special Symposium on "The Science of Hardness Testing and Its Research Applications," American Society for Metals, Detroit, Mich., Oct. 18-21:

"Hot Hardness Testing of Uranium-Plutonium Ceramics" by M. Tokar and J. L. Green, both CMB-11

Tenth National Meeting of the Society for Applied Spectroscopy, St. Louis, Mo., Oct. 18-22:

"Low Frequency Raman Spectra of Liquids Taken by a Much Improved Baffle Technique: Further Qualitative Evidence Concerning

Starunov's Theory" by L. A. Blatz, CNC-2

Scientific Session of the Chemotherapy Advisory Committee, National Cancer Institute, Bethesda, Md., Oct. 19:

"A Simple Technique for Determining Effects of Chemotherapeutic Agents on Mammalian Cell-Cycle Traverse" by R. A. Tobey, H-4 (invited)

Symposium on Ion Sources and Formation of Ion Beams, Brookhaven National Laboratory, Upton, Long Island, N.Y., Oct. 19-21:

"Lamb-Shift Polarized Ion Source for the Los Alamos Meson Physics Facility" by G. P. Lawrence, P-9

"Gadgets Demonstrating Principles Involved in Polarized Ion Sources" by J. L. McKibben, P-9 (invited)

"The Beneficial Effect of an Air Leak into the Duoplasmatron of the LASL Polarized Source" by J. L. McKibben, P-9

"LASL Experience with a Duoplasmatron Feeding a 750 kV 'Exact' Pierce Column" by C. R. Emigh, E. A. Meyer, D. W. Mueller and R. R. Stevens, Jr., all MP-4

"LAMPF H⁻ Ion Source Development" by P. W. Allison and C. R. Emigh, both MP-4

Third International Transplutonium Element Symposium, Argonne National Laboratory, Ill., Oct. 20-22:

"Calculation of Fission Barriers for Actinide and Superheavy Nuclei" by J. R. Nix, T-9 (invited)

"Fluorination and Metallurgy on a Sub-Milligram Scale" by L. B. Asprey, CNC-4

E. O. Hulburt Center for Space Research, Washington, D. C., Oct. 21:

"Recent Rocket Observations of the Far-Infrared Background" by A. G. Blair, P-DOR

Trace Elements Symposium, Environmental Health Conference, Pacific Northwest American Industrial Hygiene Association Meeting, Idaho Falls Idaho, Oct. 21-22:

"Characterization of Aerosol Sources Using Activation Analysis,

Scanning Electron Microscopy and Airborne Sampling" by W. A. Sedlacek, CNC-11 (invited)

International Association of Machinists Atomic Energy Conference, Radiation Safety Seminar, New London, Conn., Oct. 22:

"Radiation Protection Standards: Their Basis and Use" by J. W. Healy, H-DO

Physics Department, Utah State University, Logan, Oct. 25:

"Contemporary Topics in Astrophysics" by J. E. Brolley, P-DOR

Symposium on Implementing Nuclear Safeguards, Kansas State University, Manhattan, Oct. 25-27:

"Adaptability of Fissile Materials to Nuclear Explosives" by D. B. Hall, A-DO

1971 Annual Meeting, Users of Automatic Information Display Equipment, Los Angeles, Calif., Oct. 25-28:

"Managing Unmanageable Data" by L. H. Baker, J. N. Savage and E. K. Tucker, all ENG-7

Physics Department, University of Alberta, Edmonton, Canada, Oct. 27:

"The Few-Nucleon Problem" by J. E. Brolley, P-DOR

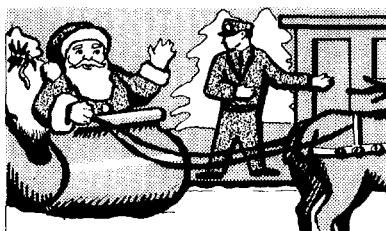
1971 Thermal Expansion Symposium, Corning, N. Y., Oct. 27-29:

"The Variation of Lattice Parameter of Uranium Monocarbide-Zirconium Monocarbide Solid Solutions with Temperature and Composition" by A. L. Bowman and N. H. Krikorian, both CMB-3, and N. G. Nereson, P-2

Pacific Coast 24th Annual Fall Regional Meeting, American Ceramic Society, Anaheim, Calif., Oct. 30-Nov. 3:

"State of the Art of Carbide-Graphite Composite Technology at the Los Alamos Scientific Laboratory" by R. E. Riley and J. M. Taub, both CMB-6

20



years ago in los alamos

Culled from the December, 1951, files of the Los Alamos Herald by Robert Porton

No Pass Needed

The Atomic Energy Commission announced that Santa Claus will not have to show an AEC pass to enter Los Alamos this Christmas. A memo stated the following: TO—The Security Division, FROM—The Field Manager, "Be prepared to admit very soon at the entrance to Los Alamos one S. Claus—Identification: a jovial whiskered gentleman in a sleigh pulled by eight reindeer—Mission: To make this city a happier place."

No Back Pay for AEC Employees

AEC employees won't get the retroactive part of a pay increase scheduled for other Federal personnel according to an announcement by the Commission's Santa Fe Operations Office. It said that a part of the legislation making salary boosts retroactive to July 8 does not apply to AEC employees and quoted a ruling from the U.S. Comptroller General.

Pinching Passengers is Costly

A Los Alamos bus driver was fined \$100 and sentenced to five days in jail for pinching two young female customers of his vehicle. He pleaded guilty of assault on a complaint from two teen-age girl passengers who claimed they were pinched when they were leaving the bus. And— he spent Christmas in jail.

Herald Stops Publishing

The Los Alamos Herald will cease publication it was announced by Lincoln O'Brien, president of New Mexico Newspapers, Inc. Reason for the suspension of the weekly paper was given as continued operating losses resulting from a lack of revenue. The Herald is the fourth Hill home newspaper which has quit publication since the Los Alamos Times, an Army-operated paper, began on May 15, 1946.

what's doing

PUBLIC SWIMMING: High School Pool—Monday through Wednesday, 7:30 to 9 p.m., Saturday and Sunday, 2 to 5 p.m., Adult Swim Club, Sunday, 7 to 9 p.m. Closed from Dec. 16 through Jan. 2.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leaders for information.

Date to be announced—Shalako Dances, Zuni Pueblo, Walter Green, 672-3203.

SIERRA CLUB: Luncheon meeting at noon, first Tuesday of each month, South Mesa Cafeteria. For information call Brant Calkin, 455-2468, Santa Fe.

LOS ALAMOS FILM SOCIETY: 7:30 p.m., Civic Auditorium. Admission: members—\$.50, others, \$2.
Dec. 29—"Paths of Glory"

RIO GRANDE RIVER RUNNERS: Meetings scheduled for noon, second Friday of each month at South Mesa Cafeteria. For information call Joan Chellis, 662-3836.

LOS ALAMOS SAILORS: Meetings at noon, South Mesa Cafeteria, first Friday of each month. For information call Dick Young, 662-3751.

MOUNTAIN MIXERS SQUARE DANCE CLUB: Mesa School, 8 p.m. For information call Florence Denbow, 662-5014.
Dec. 4—Bones Craig, club caller
Dec. 18—Bill Wright, Farmington
Dec. 31—New Year's Eve dance (9 p.m.)

NEWCOMERS CLUB: Dec. 11, 9 p.m., Elk's Lodge, Christmas dance. For information call Sally Jacoby, 662-4862.

LOS ALAMOS GEOLOGICAL SOCIETY: Third Annual Earth Treasure Show, Recreation Hall. For information call co-chairmen, Lois and Ludwig Gritz, 672-9877.

Dec. 4—10 a.m.-10 p.m.
Dec. 5—10 a.m.-6 p.m.

LOS ALAMOS CONCERT ASSOCIATION: Dec. 6, 8:15 p.m., Civic Auditorium, Ronald Williams, pianist. For information call Marilyn Stevens, 662-4873.

MESA PUBLIC LIBRARY:

Nov. 29-Dec. 13—American Field Service display by Ali Ishmael, Lebanon.

Dec. 8-Jan. 5—Quilling (paper designs), Bernice Umland.

Dec. 14-Jan. 3—Tin decorators, Beatrice Cushing.

Jan. 10-Jan. 31—Paintings, Museum of New Mexico.

Travel Programs (Slides): 7:30 p.m., Audio-Visual Room.

Jan. 4—Donald Liska, Greenland

Jan. 18—George Best, Finland

LOS ALAMOS ARTS COUNCIL: Family variety Christmas program, singing and storytelling, Dec. 12, 4 p.m., Fuller Lodge. For information call Carol Ann Mullaney, 662-4714.

LOS ALAMOS LIGHT OPERA: Dec. 3-4 and 10-11, Civic Auditorium, 8:15 p.m., "Fiddler on the Roof." Admission, \$1.50, \$2, and \$3.



Boy Scouts, Girl Scouts and Explorers from Amarillo, Texas, toured the Los Alamos Meson Physics Facility, Bradbury Science Hall and received an orientation lecture on LASL's Controlled Thermonuclear Research program. A part of the 450 scouts visiting the Laboratory are shown in this photograph as they toured LAMPF. Jim Little, MP-1, right, explains the accelerator's beam transport system.

Rear Admiral Robert Kaufman speaks to LASL officials and members of the Military Liaison Committee. The Commit-

tee, of which Kaufman is a member, visited the Laboratory last month.

